

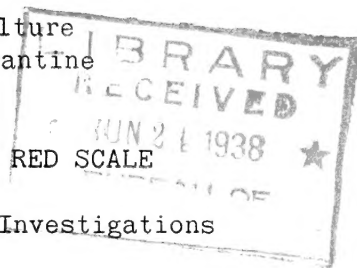
## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



May 1938

United States Department of Agriculture  
Bureau of Entomology and Plant Quarantine



A METHOD FOR INFESTING LEMON FRUIT WITH RED SCALE

By Francis Munger, Division of Fruit Insect Investigations

In laboratory studies in the fumigation of the California red scale at Whittier, Calif., infested lemon fruits from the field have been used. Scales from the field, however, are subjected to varying conditions during their growth, and lemons with sufficient scales in the desired stage are not always available.

With the view of obtaining insect material of greater uniformity, it was decided to try rearing the scale on lemons in the laboratory under uniform conditions. It had been demonstrated in life-history studies that lemons could be kept for considerable periods of time if cut with long stems. In these studies the stems were kept in water and clipped occasionally.

The red scale is ovoviviparous and stationary. The production of crawlers under favorable conditions is more or less continuous. The fumigation work required that test lemons be infested with many crawlers of the same age evenly distributed over the lemon.

A technique for infesting lemons by inducing the scales to crawl from one host to another has been developed. This technique is based upon the following three reactions of the red scale crawler: (1) Positive phototropism, (2) a tendency to wander from a heavily infested host, and (3) a tendency to settle very soon on a fresh, clean host.

Materials Required

For the technique referred to the following materials are required:

- (1) A supply of lemons bearing many producing females.  
(Heavily infested lemons from the field or lemons infested in the laboratory are satisfactory.)
- (2) Camel's-hair brushes.
- (3) Petroleum paraffin, with melting point at about 125.6° F.  
(52° C.).

- (4) Cylinders 50 mm long by 33 mm in diameter (fig. 1).
- (5) Vials 45 mm long by 23 mm in diameter (fig. 2).
- (6) Bottles (fig. 7) for holding infested lemons and keeping the stems wet.

### Procedure

The "test" lemons (lemons to be infested) picked in the field are first washed to remove red spiders and stray scales. After drying, the stem end is dipped momentarily in paraffin at 140° F. (60° C.) to a depth of about one-third of the lemon (fig. 3). The paraffin prevents the crawlers from settling on the lower parts of the lemon, where they might be injured by later handling. The tips of the stems are then clipped under water and the lemons placed on bottles filled with water (fig. 7).

"Reservoir" lemons are lemons bearing a large number of producing females. If the stems have not already separated from the lemon, they should be cut close. These lemons are prepared by first drying the stem end thoroughly and then dipping it in paraffin at 158° F. (70° C.). The paraffin adhering to the old stem attachment is removed to allow the lemon to absorb moisture later.

The glass cylinders, which are to hold water for the producing lemon, are then coated with paraffin before being attached to the reservoir lemon. The attachment (fig. 1), which must last over a period of time, should be well painted inside and out with hot paraffin.

A vial (fig. 2) is then placed in the cylinder, filled by means of a syringe, and allowed to overflow slightly for the benefit of the reservoir lemon. This vial of clean water is used to prevent the test lemon from becoming infested with the organisms of decay that are usually present on the old stem attachment. A test lemon is then sealed with hot paraffin to the top of the cylinder (fig. 4.). In sealing this lemon, it is important to leave a small vent to allow air to enter as the water is used up. Failure to do this may result both in creating a considerable vacuum and in depriving the lemons of water. The lemons attached to the cylinder, which is to serve as a bridge for the crawlers, are next placed in the control room at 77° F. (25° C.) while the infestation develops (fig. 5). (A paper cylinder of a slightly larger diameter may be used in place of glass. About three-fourths of its length should be waterproofed with hot paraffin, the rest should be dipped in shellac solution to make it tough and flexible. The flexibility of the shellacked rim will allow the test lemon when placed on it to sit so snugly as to eliminate the need for sealing it with paraffin.)

In order to hold the clean lemon uppermost and at the same time allow the light to shine from above, an adjustable metal holder

is used. This holder is composed of a tin can 5 inches in diameter and 6 inches deep. To the side of the can are soldered two 3-inch pieces of 3/16-inch copper tubing (fig. 6). A rectangularly bent piece of wire (fig. 6) with an attached ring that will fit on the blossom end of the lemon is then inserted in the copper tubing to the desired depth (fig. 6). The ring is padded with a piece of shoestring (fig. 6) to prevent injury to the oil cells of the lemon where contact is made with the wire. The holder shuts out any light coming from below and allows the light from above to exert a directive influence on the wandering crawlers. In the course of 24 hours it has been possible to collect as many as 1,700 crawlers on a single lemon.

Reservoir lemons may be expected to infest test lemons at the rate of about one per day for several weeks, depending, of course, upon the condition of the former and upon the degree of infestation required on the latter.

If the light comes from a side window, the crawlers will concentrate more on the lighted side. It has been found desirable, therefore, to revolve the lemons during the infesting process to obtain a more even distribution. Eighteen holders may be handled conveniently as a unit on a plywood tray (fig. 5).

As soon as the test lemons become infested they are replaced, given serial numbers with India ink, and finally set on bottles (fig. 7) in the control room to allow the scales to grow to the stage needed for testing.

#### Explanation of Illustrations

Figure 1.--Paraffin-coated cylinder attached to a reservoir lemon.

Figure 2.--Inner vial for watering a lemon during the infesting period.

Figure 3.--Test lemon paraffined to one-third its length.

Figure 4.--Reservoir lemon and test lemon sealed to a glass cylinder.

Figure 5.--Group of lemons on a tray being infested.

Figure 6.--Holder with a lemon in place.

Figure 7.--Lemon on a bottle.



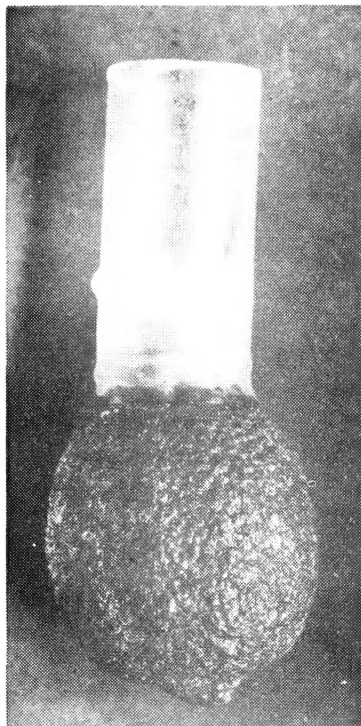


FIG. 1

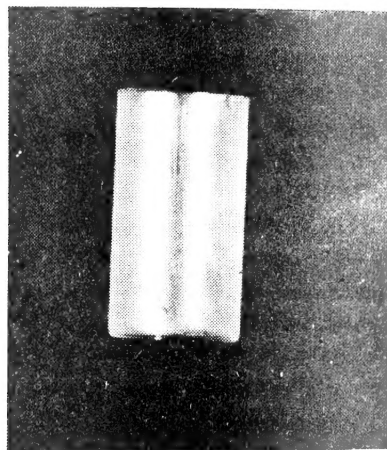


FIG. 2

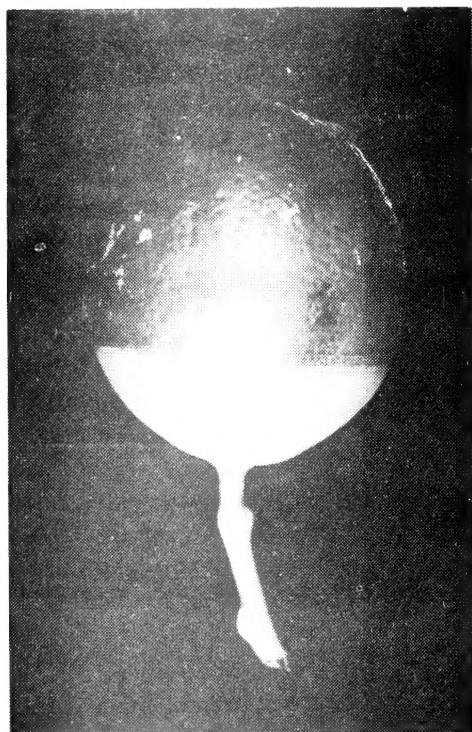


FIG. 3

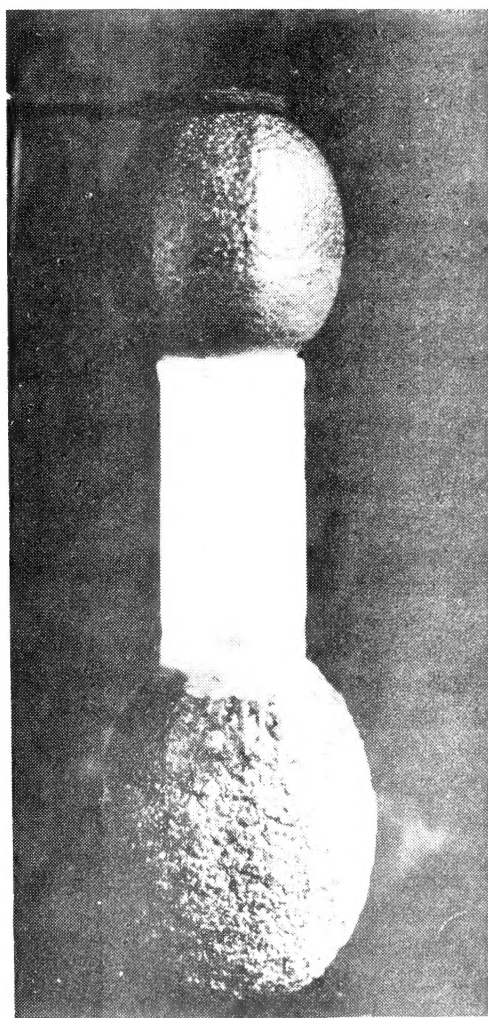


FIG. 4





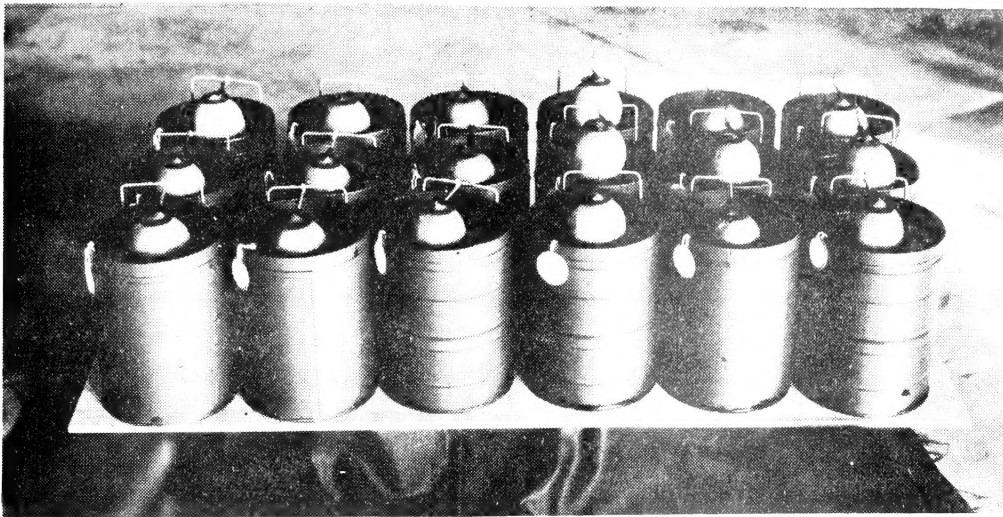


FIG. 5

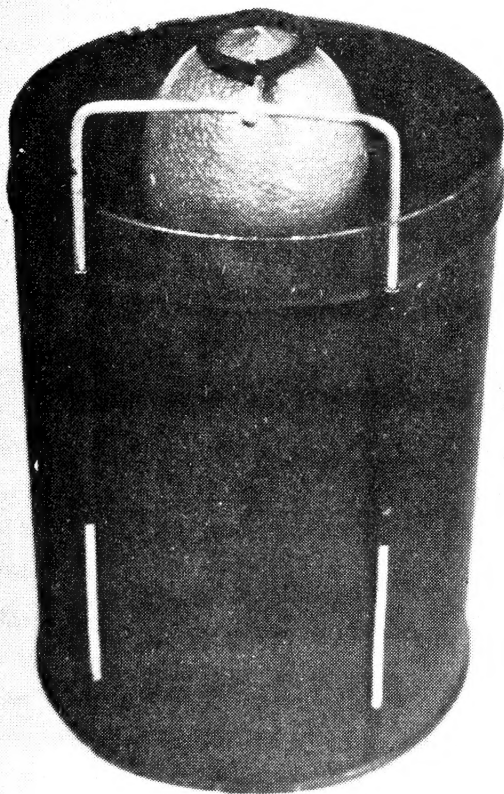


FIG. 6

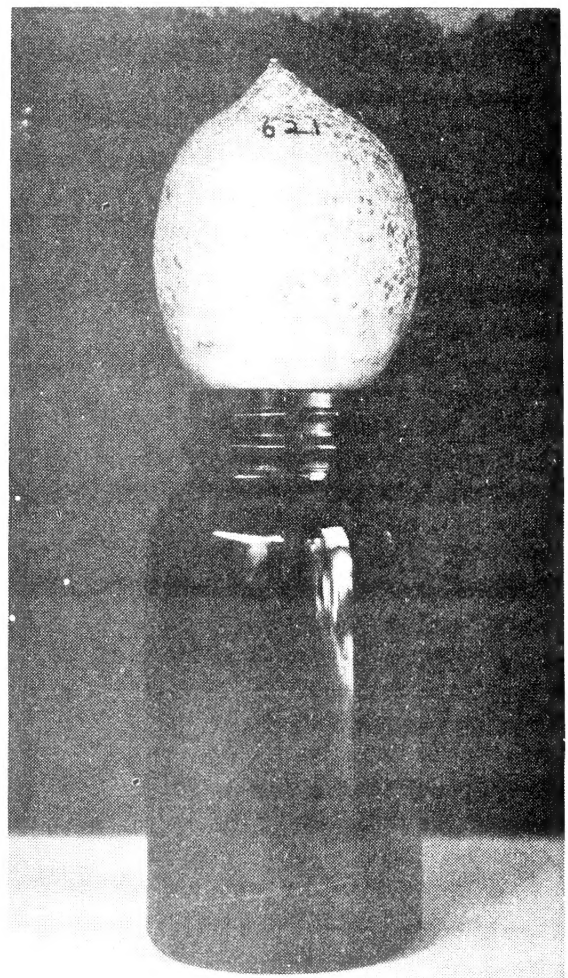


FIG. 7

